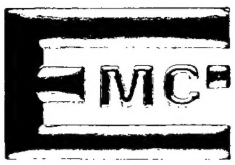

FINAL REPORT
EXECUTIVE SUMMARY

ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

PATTERSON ARMY COMMUNITY HOSPITAL FORT MONMOUTH, NEW JERSEY

Prepared For

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
NORFOLK DISTRICT
NORFOLK, VIRGINIA

Under

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EMC ENGINEERS, INC.
Denver, Colorado
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FINAL REPORT

ENERGY ENGINEERING ANALYSIS PROGRAM
PATTERSON ARMY COMMUNITY HOSPITAL
FORT MONMOUTH, NEW JERSEY

EXECUTIVE SUMMARY

Introduction

The purpose of this study was to perform a complete energy audit and analysis of Patterson Army Community Hospital at Fort Monmouth, New Jersey. Project documentation was prepared for economically feasible energy conservation opportunities (ECOs), including low cost/no cost items, as directed by appropriate personnel from Fort Monmouth.

Present Energy Consumption

Patterson Army Community Hospital (PACH) relies primarily upon electricity and fuel oil as its major sources of energy in support of daily operations. Small amounts of propane and natural gas are also utilized at the facility.

The electricity used at the hospital comes from Jersey Central Power and Light Company via the main substation and post grid at Fort Monmouth. The primary uses of electricity at PACH are lighting; Heating, Ventilating, and Air Conditioning (HVAC) and related auxiliaries; electric motors and miscellaneous equipment.

The boiler plant uses No. 2 fuel oil as its primary energy source. Major uses of the generated steam include:

- Space heating, reheat, and domestic hot water (DHW).
- The clinic addition absorption chiller.
- Sterilizers, autoclaves, and miscellaneous kitchen equipment.
- In plant auxiliaries.
- Space heating and DHW for the bachelor personnel quarters (Buildings 1077 and 1078).

The small amount of natural gas used in the hospital is for miscellaneous kitchen equipment such as ovens, griddles, and fryers. It is not metered, and therefore historical records of consumption are not available.

Propane is utilized at PACH in relatively small quantities for the incinerator. A propane storage tank located outside the boiler house is filled on an as-needed basis.

The preliminary estimates of energy consumption at PACH were based on the way the HVAC systems were operated when observed during the field survey. The operating procedure of these systems has changed since the survey in order to conform with current, stringent hospital standards. The final estimates of energy consumption are based on the anticipated usage under the current mode of operation.

The final estimated source energy use at PACH is approximately 95,500 mBtu/yr. Table ES-1 on the following page summarizes the annual energy use before and after the change in operating procedure, by energy type. As indicated by the table, fuel oil accounts for approximately two thirds of the total annual energy use, and cost, of hospital operations.

Figure ES-1 on page ES-4 graphically depicts the percentage of source energy use of each type at PACH based on corrected control energy base.

A breakdown of source energy use by functional category is given in Table ES-2 on page ES-5 and illustrated in Figure ES-2 on page ES-6. Heating and cooling, and the related ventilation fans and auxiliaries, account for a combined approximate 45% of the annual source energy use at PACH. Steam plant conversion, in-plant use, and distribution system losses are estimated responsible for approximately 25% of the consumption. The third major energy consumer is hospital lighting, accounting for 15%.

Historical Energy Consumption

The electricity used at the hospital comes from Jersey Central Power and Light Company via the main substation and post grid of Fort Monmouth. No submetering is provided for PACH, and thus no historical records for electrical demand (kW) or energy (kWh) exist for the facility. Installation of such metering for the hospital is recommended.

Fuel oil usage is recorded by plant operators on a daily basis and thus historical records of consumption exist. Usage since FY78 is summarized below.

Boiler Plant Fuel Oil (No. 2) Usage

FY	Gallons	FY	Gallons
78	383,930	82	369,280
79	408,300	83	326,950
80	425,540	84	390,262
81	412,350		

TABLE ES-1

Patterson Army Community Hospital
Energy Consumption

Type	Original Energy Base Quantity (per yr.)	Source Energy (mBtu/yr)	Annual Cost (1985 $)	Correct Operation Energy Base Quantity (per yr.)	Source Energy (mBtu/yr)	Annual Cost (1985 $)
#2 Fuel Oil	347,811 gals	48,241	$330,420	455,724 gals	63,209	$432,940
Electricity	2,506,193 kWh	29,072	$205,510	2,698,103 kWh	31,298	$221,245
Propane	3,859 gals	367	$ 3,775	3,859 gals	367	$ 3,775
Natural Gas	6,021 therms	602	$ 3,445	6,021 therms	602	$ 3,445
		78,282	$543,150		95,476	$661,405

NOTE: Values in the above listing are based upon the following conversion factors and unit costs:

Electricity: 1 kWh = 11,600 Btu; $0.082/kWh (includes demand, quantity estimated based on computer and hand calculations).

#2 Fuel Oil: 1 gal = 138,700 Btu; $0.95/gal (quantity based on average consumption CY 81-83).

Propane: 1 gal = 95,000 Btu; $0.978/gal (quantity based on FY 84 consumption).

Natural Gas: 1 therm = 100,000 Btu; $0.572/therm (quantity estimated based on hand calculations).

FIGURE ES—1

PATTERSON TOTAL ENERGY COMPARISON

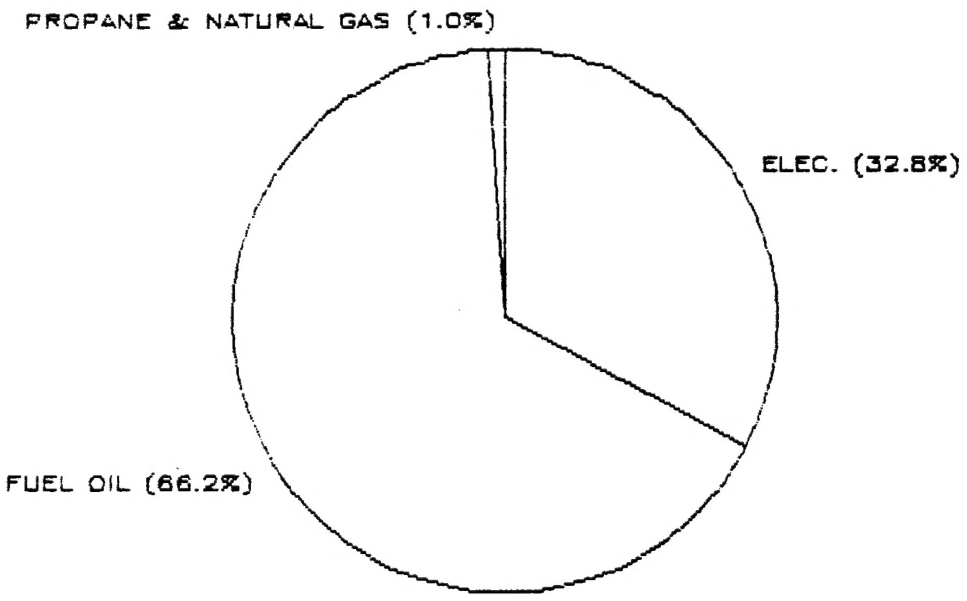


TABLE ES-2

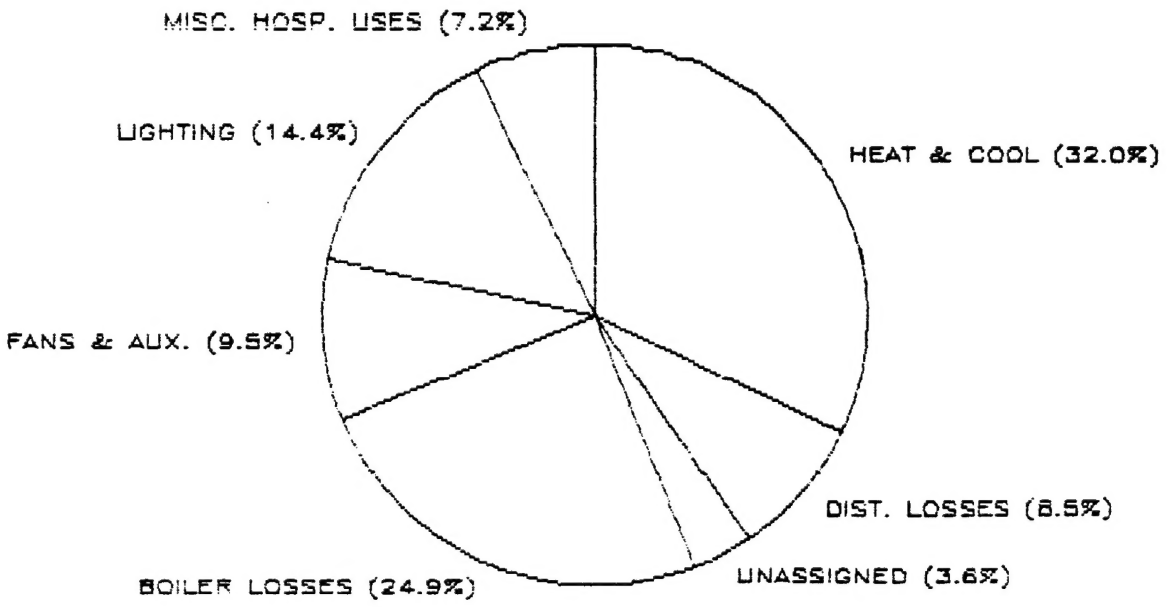
PATTERSON ARMY COMMUNITY HOSPITAL
SOURCE ENERGY USE BY CATEGORY

Category	Elec* (mBtu/yr)	Fuel Oil (mBtu/yr)	Prop & NG (mBtu/yr)	Total (mBtu/yr)	% of Total
HEATING & COOLING	3,463	27,027	-	30,490	31.9
BOILER LOSSES & IN PLANT USE	505	23,226	-	23,731	24.8
LIGHTING	13,772	-	-	13,772	14.5
FANS & HVAC AUX	9,049	-	-	9,049	9.5
DIST. & TRANS. LOSSES	570	7,550	-	8,120	8.5
MISC. HOSP. USES	3,939	1,970	969	6,878	7.2
UNASSIGNED	N/A	3,436	N/A	3,436	3.6
TOTALS	31,298	63,209	969	95,476	100.0

*Based on 11,600 kWh/mBtu.

FIGURE ES–2

BREAKDOWN OF SOURCE ENERGY USE



Since its construction in the early 1950s, the hospital has undergone several modifications which have impacted the energy use at the facility. Significant ones include:

- In 1960 a separate 20 ton package A/C unit was installed to serve the old emergency area and adjacent x-ray area.
- In 1961 a new five ton package A/C unit was installed to supplement the existing air conditioning system in the laboratory.
- In 1966 the basement ventilation system was modified and a new five ton unit installed to serve the autopsy area.
- In 1966 a new Rotary Cup Oil burner was installed on No. 2 boiler.
- In 1967 the basement ventilation was modified.
- In 1968 the basement ventilation system was extended.
- In 1969 a new master heating control and monitoring panel was installed.
- In 1973 the outpatient treatment center was added to the facility, and additional air conditioning retrofitted to portions of the original hospital.
- In 1979, as part of a major Installation Economic Improvement Project, caulking and weather stripping of the PACH complex was completed and storm windows installed.

The 1979 upgrade of the building envelope is the only major energy saving construction project identified as having been implemented at PACH. The energy crisis did, however, bring a significant change to the operation of heating and cooling systems at the hospital. Essentially this operational change was to provide cooling only during the summer, and heating only during the winter, thereby eliminating the possibility of (and associated excess energy consumption of) simultaneous heating and cooling. This procedural change significantly reduced energy consumption at PACH. Due to the design of the HVAC systems at the hospital, however, it also rendered them ineffective at maintaining required environmental conditions within the hospital. The operation of the HVAC systems has recently been changed back to the manner for which they were designed because of this.

Energy Conservation Analysis

Approximately 40 ECOs were found to be applicable to PACH. Each was evaluated to determine potential energy and operating cost savings. Based upon estimated construction costs, life cycle economics (based upon ECIP criteria) were calculated. The results are summarized in Table ES-3 on page ES-8.

Of the ECOs evaluated, those showing viable life cycle economics (SIR greater than 1.0), and recommended for implementation, are summarized in Table ES-4 on page ES-9.

TABLE ES-3
ENERGY CONSERVATION OPPORTUNITY SUMMARY
PATTERSON ARMY COMMUNITY HOSPITAL
(ANALYSIS DATE - SEPTEMBER, 1986)

ECO TYPE	ECO NUMBER	ECO DESCRIPTION	ELECTRIC SAVINGS (MBTU/YR)	FUEL OIL SAVINGS (MBTU/YR)	NON ENERGY SAVINGS ($/YR)	DOLLAR SAVINGS ($/YR)	CONSTRUCT COST ($)	SIMPLE PAYBACK (YR)	DISCOUNTED SAVINGS RATIO
BOILER	1	REDUCE STEAM PRESSURE	0	120	0.00	709.00	18,700.00	26.4	0.42
	3	INCREASE BOILER EFFICIENCY	0	7,129	-4320.00	37812.00	53,600.00	1.4	12.00
	14	INSTALL 100HP BOILER	0	1,468	0.00	8676.00	158000.00	18.2	0.94
ENVELOPE	3	ROOF INSULATION	0	317	0.00	1873.00	29,900.00	16.0	1.03
	5	REFLECTIVE WINDOW COATING	42	-278	0.00	-1339.00	10,600.00	-7.9	-2.21
	6	INSTALL WALL INSULATION	55	1,108	0.00	6946.00	322000.00	46.4	0.38
	7	REDUCE GLASS AREA	3	-200	0.00	-1160.00	3,800.00	-3.3	-5.05
	8	MOVEABLE WINDOW INSULATION	0	71	0.00	486.00	38,461.00	79.1	0.21
EQUIPMENT	1	SHUT OFF ELEVATORS	55	0	0.00	398.00	260.00	0.7	13.98
	3	INCREASE POWER FACTOR	0	0	58.00	58.00	1,350.00	23.3	0.39
	4	BALANCE LOADS	6	0	0.00	43.00	9,300.00	216.3	0.06
	5	BALANCE LOADS ON TRANSFORMERS	113	0	0.00	818.00	9,300.00	11.4	1.04
HVAC	1	SHUT OFF AHU'S AND FAN COILS	1,309	8,235	0.00	58146.00	9,022.00	0.2	69.63
	2	REDUCE OUTSIDE AIR	583	1,092	0.00	10675.00	1,296.00	0.1	85.16
	3	REDUCE AIR FLOW THROUGH AHU	600	0	0.00	4344.00	13,373.00	3.1	2.97
	5	SHUT OFF STAIRWAY HEATING	0	42	0.00	248.00	560.00	2.3	4.93
	6	SHUT OFF CIRC. PUMPS	17	0	0.00	123.00	518.00	4.2	2.17
	12	REPAIR STEAM TRAPS	0	1,756	0.00	10378.00	4,460.00	0.4	38.31
	13	SHUT OFF AIR TO UNOCC. ZONES	933	1,069	0.00	13073.00	17,630.00	1.3	7.49
	15	RAISE CHILLED WATER TEMP.	0	1,200	0.00	7092.00	27,400.00	3.9	2.88
	17	INSTALL ENTHALPY ECONOMIZERS	384	4,256	0.00	27933.00	41,100.00	1.5	7.43
	21	INSTALL MINIMUM SIZE MOTORS	30	0	0.00	217.00	1,773.00	8.2	1.12
	23	VARIABLE AIR VOLUME CONVERSION	660	5,612	0.00	37945.00	82,340.00	2.2	5.10
	24	INSULATE PIPING	0	378	0.00	2234.00	8,800.00	3.9	4.18
	29	REPAIR COOLING TOWER CONTROLS	944	0	0.00	6835.00	134.00	0.0	465.57
	30	VARIABLE SPEED COOLING TOWER	452	0	0.00	3272.00	13,000.00	4.0	2.30
	31	REPLACE ABSORPTION CHILLER	-5,489	16,012	0.00	54880.00	179000.00	3.3	6.40
	32	INSTALL FC AND ROOFTOP UNIT	3,515	6,800	0.00	65637.00	157000.00	2.4	4.33
	33	INSTALL STRAINER CYCLE	547	0	0.00	3960.00	50,400.00	12.7	0.93
	34	REPLACE BAC COOLING TOWER	295	0	0.00	2136.00	41,000.00	19.2	0.48
KITCHEN	1	SHUT OFF RANGE HOOD EXHAUST	111	194	0.00	1950.00	260.00	0.1	77.30
	6	SHUT OFF LIGHTS IN COOLER	15	0	0.00	109.00	232.00	2.1	4.27
LIGHTING	2	REDUCE LIGHTING LEVELS	492	0	0.00	3562.00	4,044.00	1.1	10.45
	4	CONVERT LIGHTING	1,374	0	1043.00	10991.00	19,100.00	1.7	6.82
MISC.	1	HEAT RECOVERY ON INCINERATOR	0	148	-368.00	1155.00	27,000.00	23.4	0.85
	2	EXPANSION EMCS	5,052	6,916	-12300.00	65150.00	204966.00	3.1	3.49
	2	SMALL EMCS	2,026	15,880	-22300.00	81539.00	370765.00	4.5	2.74
	3	EMERGENCY GENERATORS	626	-1,108	12498.00	5815.00	0.00	0.0	0.00
PLUMBING	1	REDUCE DHW TEMP & FLOW RES	0	288	0.00	1702.00	24,500.00	14.4	1.14

TABLE ES-4
SUMMARY OF ECONOMICALLY VIABLE ECOs
PATTERSON ARMY COMMUNITY HOSPITAL
(ANALYSIS DATE - SEPTEMBER, 1986)

ECO TYPE	ECO NUMBER	ECO DESCRIPTION	ELECTRIC SAVINGS (MBTU/YR)	FUEL OIL SAVINGS (MBTU/YR)	NON ENERGY SAVINGS ($/YR)	DOLLAR SAVINGS ($/YR)	CONSTRUCT COST ($)	SIMPLE PAYBACK (YR)	DISCOUNTED SAVINGS RATIO
HVAC	29	REPAIR COOLING TOWER CONTROLS	944	0	0.00	6835.00	134.00	0.0	465.57
HVAC	2	REDUCE OUTSIDE AIR	583	1,092	0.00	10675.00	1,296.00	0.1	85.16
KITCHEN	1	SHUT OFF RANGE HOOD EXHAUST	111	194	0.00	1950.00	260.00	0.1	77.30
HVAC	1	SHUT OFF AHU'S AND FAN COILS	1,309	8,235	0.00	58146.00	9,022.00	0.2	69.63
HVAC	12	REPAIR STEAM TRAPS	0	1,756	0.00	10378.00	4,460.00	0.4	38.31
EQUIPMENT	1	SHUT OFF ELEVATORS	55	0	0.00	398.00	260.00	0.7	13.98
BOILER	3	INCREASE BOILER EFFICIENCY	0	7,129	-4320.00	37812.00	53,600.00	1.4	12.00
LIGHTING	2	REDUCE LIGHTING LEVELS	492	0	0.00	3562.00	4,044.00	1.1	10.45
HVAC	13	SHUT OFF AIR TO UNOCC. ZONES	933	1,069	0.00	13073.00	17,630.00	1.3	7.49
HVAC	17	INSTALL ENTHALPY ECONOMIZERS	384	4,256	0.00	27933.00	41,100.00	1.5	7.43
LIGHTING	4	CONVERT LIGHTING	1,374	0	1043.00	10991.00	19,100.00	1.7	6.82
HVAC	31	REPLACE ABSORPTION CHILLER	-5,489	16,012	0.00	54880.00	179000.00	3.3	6.40
HVAC	23	VARIABLE AIR VOLUME CONVERSION	660	5,612	0.00	37945.00	82,340.00	2.2	5.10
HVAC	5	SHUT OFF STAIRWAY HEATING	0	42	0.00	248.00	560.00	2.3	4.93
HVAC	32	INSTALL FC AND ROOFTOP UNIT	3,515	6,800	0.00	65637.00	157000.00	2.4	4.33
KITCHEN	6	SHUT OFF LIGHTS IN COOLER	15	0	0.00	109.00	232.00	2.1	4.27
HVAC	24	INSULATE PIPING	0	378	0.00	2234.00	8,800.00	3.9	4.18
MISC.	2	EXPANSION EMCS	5,052	6,916	-12300.00	65150.00	204966.00	3.1	3.49
HVAC	3	REDUCE AIR FLOW THROUGH AHU	600	0	0.00	4344.00	13,373.00	3.1	2.97
HVAC	15	RAISE CHILLED WATER TEMP.	0	1,200	0.00	7092.00	27,400.00	3.9	2.88
MISC.	2	SMALL EMCS	2,026	15,880	-22300.00	81539.00	370765.00	4.5	2.74
HVAC	30	VARIABLE SPEED COOLING TOWER	452	0	0.00	3272.00	13,000.00	4.0	2.30
HVAC	6	SHUT OFF CIRC. PUMPS	17	0	0.00	123.00	518.00	4.2	2.17
PLUMBING	1	REDUCE DHW TEMP & FLOW RES	0	288	0.00	1702.00	24,500.00	14.4	1.14
HVAC	21	INSTALL MINIMUM SIZE MOTORS	30	0	0.00	217.00	1,773.00	8.2	1.12
EQUIPMENT	5	BALANCE LOADS ON TRANSFORMERS	113	0	0.00	818.00	9,300.00	11.4	1.04
ENVELOPE	3	ROOF INSULATION	0	317	0.00	1873.00	29,900.00	16.0	1.03

Based upon guidance from the Division of Engineering and Housing (DEH), Fort Monmouth, economically viable ECOs were grouped into the following projects for purposes of evaluation and preparation of Productivity Capital Investment Program (PCIP) funding documents:

Project No.	ECO No.	PECIP Project Description
1	HVAC-31	Replace Absorption Chiller
2	HVAC-32	HVAC Modifications
3	MISC-2	EMCS Expansion
4	HVAC-2	Reduce Outside Air and VAV Conversion
5	Boiler-3	Improve Boiler Efficiency
	HVAC-12	Repair Steam Traps
	HVAC-24	Insulate Piping
6	HVAC-29	Repair Cooling Tower Controls
	HVAC-30	Variable Speed Drive on Cooling Tower Fans
7	Kitchen-6	Lighting Timers
	Light-2	Reduce Lighting Level
	Light-4	Convert Lighting to Energy Efficient Types

The projects listed above were evaluated in the priority order shown based on direction from DEH. It is expected the projects will be funded and constructed in the order shown. The projects were evaluated taking into account interactions between the ECOs within the project group, and also interactions with other projects evaluated previously to it. For example, all projects evaluated after the absorption chiller replacement assumed a new electrical centrifugal chiller was installed. Thus, any cooling energy savings would involve reduction in electrical energy, not fuel oil from a steam absorption chiller.

Two separate projects, Projects 1 and 2, are interrelated. It was assumed that the chiller replacement and new chilled water lines in Project 1 would be installed up to the main hospital from the clinic prior to the HVAC modifications being made in Project 2. The cost for Project 2 only included distribution piping from the chilled water header for the new fan coils.

Project 4, reduced outside air and VAV conversion, is the only ECO that did not meet minimum Productivity Enhancing Capital Investment Program (PECIP) funding requirements.

Pertinent data for the remaining six PECIP projects are summarized in Table ES-5 on the following page. As indicated therein, implementation of the projects would result in source energy savings of over 35,000 mBtu of fuel oil and 6,500 mBtu of electrical energy. It is recommended these projects be funded and implemented for PACH.

TABLE ES-5
PATTERSON ARMY COMMUNITY HOSPITAL
EEAP STUDY
ENERGY PROJECT SUMMARY

ECO PROJECT	ECO DESCRIPTION	ANNUAL SAVINGS FUEL OIL MBTU/YR	ELECTRIC MBTU/YR	MISC $/YR	TOTAL $/YR	CAPITAL COST($)	S & A COST($)	SIMPLE PAYBACK	PCIP SIR	ECIP SIR	ANAL-YSIS DATE	PRGM FY	PRGM YR COST
1	REPLACE ABSORPTION CHILLER	16,012	-5,489	0	54,880	169,797	9,339	3.3	2.92	6.40	SEP 86	88	NA
2	HVAC MODIFICATIONS	6,603	3,515	0	64,473	104,834	5,766	1.7	4.65	6.36	SEP 86	88	NA
3	EMCS EXPANSION	6,916	5,052	-12,300	65,162	194,281	10,685	3.2	2.50	3.50	SEP 86	88	NA
5	TRAPS, INSULATION BOILER EFFICIENCY	5,550	0	-4,320	28,481	85,734	4,715	3.2	3.45	6.30	SEP 86	88	NA
6	REPAIR CONTROLS VSD CONTROL	0	1,558	0	11,287	20,033	1,102	1.9	4.30	5.10	SEP 86	88	NA
7	SHUT-OFF OR REDUCE LIGHTS	0	1,882	1,437	15,065	20,026	1101	1.4	6.14	8.90	SEP 86	88	NA
TOTAL:		35,081	6,518	-$15,183	$239,348	$594,705	$32,708						

With the current configuration of the HVAC system, and the stringent environmental requirements, the availability of both heating and cooling capacity to air handling units is required at all times of the year to enable maintaining mandated environmental conditions in patient and operational areas of the hospital. This has increase the energy consumption of PACH. Until modifications can be made to the HVAC systems as a result of the PECIP projects, such operation of the systems must continue. The implementation of recommended ECOs will help to minimize the effect created by the change in operation of the HVAC systems.

Based upon field observation of the HVAC equipment at PACH, proper operation of the systems would be greatly enhanced through additional preventive and corrective maintenance of the equipment. This is especially true with the HVAC control systems.

Investigation of the boiler plant also revealed a relatively high amount of makeup water usage. Further investigation of the condensate system should be considered.

Energy Cost Savings

The potential effects of these projects on PACH total present energy usage are shown below.

	Fuel Oil (mBtu/yr)	Electricity (mBtu/yr)	Prop & NG (mBtu/yr)	Total (mBtu/yr)	Percent of Present Use
Present	63,209	31,298	969	95,476	100%
Savings, Proj. 1, 2, 3, 5, 6, 7	-35,081	- 6,518	0	-41,599	43%
Resulting	28,128	24,780	969	53,877	57%

The projects result in an approximate 56% reduction in fuel oil use and 21% decrease in electrical energy requirements. The combined effect is to reduce total source energy consumption at PACH by approximately 43%.

The effect on annual energy costs is:

	Fuel Oil ($/yr)	Electricity ($/yr)	Prop & NG ($/yr)	Total ($/yr)	Percent of Present Cost
Present	$432,940	$221,245	$7,220	$661,405	100%
Savings, Proj. 1, 2, 3, 5, 6, 7	-240,282	- 46,076	0	-286,358	42%
Resulting	$192,658	$175,169	$7,220	$375,047	58%

Note the above tabulation does not include the expected increase of approximately $15,183 in operational and maintenance costs associated with the projects. (These costs are shown as miscellaneous in Table ES.5.) The combined effect of implementing the six projects is an expected 42% reduction in annual energy costs. Considering the total estimated implementation cost of approximately $627,000, these savings yield a simple payback of slightly less than two years for the overall combined grouping.

Other ECO Project Summary

After combining various energy conservation projects (ECOs) for PECIP funding, as directed by DEH, there were some miscellaneous projects left over which are economically justified.

The remaining ECOs, listed in Table ES-6 on page ES-14 may be accomplished through other funding programs for military construction. On the low cost items, the Ft. Monmouth maintenance contractor could do most of these ECOs. The HVAC ECOs evaluated as PECIP Project 4 should also be considered.

Important notes to remember for future consideration of these projects:

- HVAC ECO-13 - Shut off air to unoccupied zones is mutually exclusive to PECIP Project 2. If PECIP Project 2 is funded, HVAC ECO-13 should not be considered further.
- HVAC ECO-3 - Reduce air flow is mutually exclusive to HVAC ECO 23 Variable Air Volume Conversion. HVAC ECO-3 would permanently change the flow on AC-1 through AC-4 by changing sheaves. HVAC ECO-23 would vary the volume based on temperature modulating. One project would eliminate the need for the other project.

TABLE ES-6
SUMMARY OF ECONOMICALLY VIABLE ECOs
NOT INCLUDED IN PECIP PROJECTS
PATTERSON ARMY COMMUNITY HOSPITAL
(ANALYSIS DATE - SEPTEMBER, 1986)

ECO TYPE	ECO NUMBER	ECO DESCRIPTION	ELECTRIC SAVINGS (MBTU/YR)	FUEL OIL SAVINGS (MBTU/YR)	NON ENERGY SAVINGS ($/YR)	DOLLAR SAVINGS ($/YR)	CONSTRUCT COST ($)	SIMPLE PAYBACK (YR)	DISCOUNTED SAVINGS RATIO
HVAC *	2	REDUCE OUTSIDE AIR	174	327	0.00	3202.50	1,296.00	0.4	25.64
HVAC	13	SHUT OFF AIR TO UNOCC. ZONES	933	1,069	0.00	13073.00	17,630.00	1.3	7.49
HVAC	5	SHUT OFF STAIRWAY HEATING	0	42	0.00	248.00	560.00	2.3	4.93
HVAC	3	REDUCE AIR FLOW THROUGH AHU	600	0	0.00	4344.00	13,373.00	3.1	2.97
HVAC *	23	VARIABLE AIR VOLUME CONVERSION	198	1,683	0.00	11383.50	82,340.00	7.2	1.51
PLUMBING	1	REDUCE DHW TEMP & FLOW RES	0	288	0.00	1702.00	24,500.00	14.4	1.14
HVAC	21	INSTALL MINIMUM SIZE MOTORS	30	0	0.00	217.00	1,773.00	8.2	1.12
EQUIPMENT	5	BALANCE LOADS ON TRANSFORMERS	113	0	0.00	818.00	9,300.00	11.4	1.04
ENVELOPE	3	ROOF INSULATION	0	317	0.00	1873.00	29,900.00	16.0	1.03

1891 12404 80,702

* THE SAVINGS WERE REDUCED BY A FACTION OF 50 HRS PER WEEK/168 HRS PER WEEK, TO ACCOUNT FOR RUN TIME OF AHU'S AFTER PECIP PROJECT 2 & 3.

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